

REMARKS

Introduction:

The present amendment is provided in response to the Nonfinal Office Action with a mailing date of September 27, 2004. Claims 37, 39, 40, 42, 48, and 51 have been amended to be more consistent with the changes made to the claims in the response mailed on December 9, 2003. Claims 57-66 have been added to claim further inventive aspects of the present application. By way of clarification, it should be noted that claims 1-33, 36, 43, 49, and 55 were previously cancelled.

Accordingly, claims 34, 35, 37-42, 44-48, 50-54, and 56-66 are currently pending for reconsideration, corresponding to a total of 29 claims with 4 being of independent form. Because fees have been previously paid for the originally filed claims 1-33 with 5 being of independent form, it is believed that no further claim fees are due; however, should additional fees be required, please charge any fees due to Deposit Account No. 23-3030, but not to include issue fees.

Upon review of this matter, it was unclear whether small entity status was recognized. To clarify, Applicant hereby claims entitlement to small entity status. A declaration of the inventors under 37 CFR 1.131 and a declaration under 37 CFR 1.132 are provided herewith. Reconsideration of the present application, as amended, and in view of the following comments is respectfully requested.

Prior Submission Status:

As a result of changes made to the claims during the prosecution of this application, a request to amend the inventorship was previously made by a separate paper submitted on December 9, 2003. Specifically, deletion of the named inventors Robert C. Bilger and Douglas L. Jones was requested. Acknowledgement of this inventorship change is respectfully requested.

Furthermore, in the prior Office Action with a mailing date of March 10, 2004, a terminal disclaimer was submitted in response to certain obviousness-type double patenting rejections with respect to U.S Patent Application No. 08/666,757, now U.S. Patent No. 6,222,927 (the "Parent Application"). Acknowledgement of receipt and acceptance of the terminal disclaimer is respectfully requested. It is presumed that the double patenting rejection has been withdrawn from the context of the current Office Action.

The Claims are Patentable over the Asserted Reference Combination:

Claims 34-35, 37-42, 44-48, 50-54, and 56 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,002,776 to Bhadkamkar in view of U.S. Patent No. 4,601,025 to Lea and U.S. Patent No. 5,581,620 to Brandstein et al. The Applicants respectfully traverse. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim

limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." Manual of Patent Examining Procedure (MPEP) §2142 (*citing In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). Moreover, the claims must not be treated as "mere catalogs of separate parts, in disregard of the part-to-part relationships set forth in the claims and that give the claims their meaning." *Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Company et al.*, 730 F.2d 1452, 1459, 221 USPQ 481, 486 (Fed. Cir. 1984).

In regard to independent claim 34, it is respectfully submitted that there are several features not taught or suggested in the asserted combination of references. For example, the Office Action relies on column 8, lines 18-31 of Bhadkamkar to assert that the DOA estimator 20 function of "assessing the directions of arrival, reads on 'determining location of the second sound source relative to the first source as a function of the first and second signals.'" (Office Action, p. 3). As indicated in the Office Action, the DOA estimator 20 function is to provide relative time delay values to separator 30. Provision of these time delay values does not teach or suggest the claimed operation of determining location of a source of an interfering signal relative to that of a source of a desired signal, giving such terminology its broadest reasonable meaning. Furthermore, the generally vague 'direction of arrival' description does not teach or suggest the specific features and relationships claimed. Even assuming *arguendo* that one can determine location of one source relative to that of another with the time delays provided by DOA estimator 20, "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination."

MPEP §2143.01 (*citing, In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)). Such a suggestion is absent.

Recognizing that various features of claim 34 are not taught or suggested by Bhadkamkar, the Office Action turns to column 4 of the Lea reference. The Office Action proposes to "incorporate an individual correlator system as taught by Lea as part of the DOA estimator of the system of Bhadkamkar." (Office Action, page 5). The Office Action indicates that an 'individual correlator system' includes delay lines 42 and 44 and correlators 46. The Office Action offers that "[t]he motivation behind such a modification would have been that such a correlator system is known in the art to provide a substantial degree of parallel processing, and require minimal control overhead in establishing the possible incident angles." These contentions miss the mark. Referencing the establishment of possible incidence angles (a goal of Lea, not Bhadkamkar) is not a logical motive to combine the two references. As previously confirmed by the Office Action, the output of the DOA estimator 20 to separator 30 are delay values -- not incidence angles. Even if estimator 20 output such angles, separator 20 is ill-equipped to utilize them.

Also, what proof is offered that the resulting system provides a substantial degree of parallel processing or minimal control overhead? No source is referenced. Accordingly, to the extent this assertion is based on well-known art, common knowledge, or personal knowledge, one or more references as appropriate are requested in support of such contentions per MPEP §2144.03.

Besides these weaknesses, there are further reasons that the requisite motivation to combine is absent. For example, correlators 46 each provide an output, three of which are specifically designated by d, e, and f with ellipses representing others. If this is the interface to separator 30 intended in the Office Action, how are these outputs in excess of the two separator inputs being interfaced? The selection of some but not others and/or somehow combining the

outputs would likely undermine operability. Furthermore, modifying the correlators and delay line taps to just two is of doubtful usefulness. Such incongruence brings into question the operability of the proposed combination. "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." MPEP §2143.01. MPEP §2143.01 also states that "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious."

The Office Action also cites to column 4, lines 59-66 of Lea stating that the "identification of a peak indication gives rise to the time differential between the angle of incidence of the received sound and the phase center of the two receiving elements." For the sake of clarification, the referenced passage is included in the following reproduced from Lea (column 4, line 59 through column 5, line 10):

The output signals from the correlators 45 are coupled to processor 46, which may contain a network of comparators and logic circuits, to determine the taps that give rise to the maximum correlation signal, thereby determining the time differential of the received signals at the phase centers of the interferometer formed by the upper beam former 29 and the lower beam former 27. Similarly, the time differentials of received signals at the phase centers of the upper beam former 26 and the lower beam former 30 are determined by the delay line 49, tap delay lines 51, 52 and correlators 53. Time differentials so determined are coupled to subtraction network 54 wherefrom the difference in the time differentials, given by equation 16, is coupled to a computer 55 for the determination of a depression angle in accordance with equation 12. Computer 55 contains a multiplier 56 to which signals representative of $V_1/2h$ and (t_1-t_2) are coupled for multiplication to provide a signal at an output terminal 57 that is representative of the depression angle E_D .

From this passage, it is unclear how it conveys a "time differential between the angle of incidence of the received sound and the phase center of the two receiving elements" as recited in the Office Action -- as well as what is meant by this Office Action statement.

Nonetheless, it is surmised that in relying on this language, the time differentials referenced in the Office Action might be Lea's t_1 and/or t_2 rather than the correlator outputs (d, e, f); however, as perhaps best shown in Fig. 4b, the derivation of t_1 and of t_2 depends on the inputs a, b, and c from two other delay lines 51 and 52, and associated correlators 53. Correspondingly, the inclusion of this additional hardware is inconsistent with the explanation given earlier in the Office Action. Moreover, it is speculative at best that separator 30 would suitably work with t_1 and/or t_2 . Indeed, the incidence angle sought by Lea depends on determining the difference between these values with subtraction network 54. Also, as described in columns 2 and 3 of Lea, its operation depends on use of four subarrays with a particular geometric orientation. Thus, there are numerous reasons that the asserted combination of Bhadkamkar and Lea is improper.

The addition of the Brandstein reference does nothing to cure such deficiencies. Moreover, the proffered motivation "that processing in the frequency domain is well known in the art to allow for adaptive bit allocation, depending on a desired degree of frequency resolution...[and that]...relative signal processing would have been desirable because it would have enabled a target signal to be isolated and enhanced" again misses the mark. This statement and the balance of the discussion concerning Brandstein appears to rely heavily on a "frequency domain" attribute. However, such terminology is not included in independent claim 34, and does not seem relevant to the features for which this reference is offered. The same can be said for "adaptive bit allocation" and "degree of frequency resolution." Further, to the extent this

statement relies on well-known art or common knowledge, one or more references in support thereof are requested per MPEP §2144.03.

The Office Action explanation on pages 6 and 7 makes some general observations about Brandstein and compares certain aspects to those of Bhadkamkar; however, it fails to describe with any degree of specificity what portion of Brandstein is being combined with or used to modify the Bhadkamkar/Lea combination. Absent such specificity, establishment of a *prima facie* case under §103 is further lacking. Where a "statement is of a type that gives only general guidance and is not specific as to the particular form of the claimed invention and how to achieve it ... [s]uch a suggestion may make an approach 'obvious to try' but it does not make the invention obvious." *Ex parte Obukowicz*, 27 USPQ2d 1063, 1065 (U.S. Pat. and Trademark Off. Bd. of Pat. App. & Interferences 1993) (*citations omitted*).

Instead, the Office Action generally contends that Brandstein renders obvious generating a characteristic signal representative of the desired acoustic signal during determining location of the second source; where the interfering signal is from this second source, not the desired acoustic signal. Assuming *arguendo* one allocates the claimed features to the different references in the manner asserted in the Office Action, the operation of generating the characteristic signal with the Brandstein contribution occurs during determining location with the Lea-modified estimator of Bhadkamkar. Considering first the proposed Bhadkamkar/Lea estimator, the contended "location" determination is provided to Bhadkamkar's separator 30 prior to generation of any type of desired output signal from Bhadkamkar. It would not properly operate if this output was generated during the location information determination. For the unspecified Brandstein piece to generate the characteristic signal as a modification of the Bhadkamkar/Lea estimator, it renders the balance of Bhadkamkar, including the separator,

irrelevant -- in effect mutilating the primary reference, and thwarting the logic upon which the assertion of Bhadkamkar initially was based. The same result occurs if the unspecified Brandstein piece is independent of the balance of Bhadkamkar. If the unspecified Brandstein piece is being incorporated into Bhadkamkar's separator or another part of it in order to operate during the estimator's location determination, the operating principles of Bhadkamkar are again undermined. Accordingly, the asserted combination of references fails to establish a *prima facie* case of obviousness. With regard to the other rejected claims, at least the same reasons as provided for claim 34 supports patentability.

In addition, further reasons independently support patentability of the remaining rejected claims. For example, the features of dependent claim 37 include the characteristic signal being determined from a signal pair having a first member from the delayed first signals and a second member from the delayed second signals. The Office Action relies on Lea's maximum correlation to teach this signal pair; however, a characteristic signal generated during determining location [from base claim 34], cannot at the same time be determined from the Lea-modified estimator and unspecified Brandstein contribution. In other examples, claims 39 and 41 depend from claim 39, and are further patentable for at least the same reasons.

Further grounds also support patentability of claim 40 in addition to its dependence on claim 39. For instance, on pages 9-10 of the Office Action, it is contended that equations 9(a) or 9(b) of Lea teach a characteristic signal that corresponds to a fraction with a numerator determined from at least the first and second members. In these equations, t_1 and t_2 represent specific durations of time for the particular geometry shown in Fig. 2A. The Office Action then turns to equation 13 of Lea regarding a coarse delay adjustment value t_D provided by delay unit

41 (see Fig. 5, also). Notably, equations 9(a), 9(b), and 13 all express the same relationship in terms of time, distance, velocity, and the angle θ :

$\cos \theta = \frac{\text{velocity} * \text{time}}{\text{Length}}$, (See, equations 9(a), 9(b)),
or rearranging:

$$\text{Time} = \frac{\text{Length} * \cos \theta}{\text{velocity}} \text{ (See, equation 13).}$$

The Office Action appears to assert that rearranging equation 13 in terms of L and substituting for L in equation 9(a) or 9(b) teaches a denominator determined from at least the first increment. What the Office Action fails to explain is how such a substitution is suggested or motivated. Why would one make the substitution and how would one pick between 9(a) and 9(b)? To the contrary, rearranging a relationship and substituting the rearrangement into the same relationship is typically expected to provide an identity or ratio that does little to advance a solution. For the particular example, if L and V are the same as indicated in the Office Action, then the suggested substitution results in the ratios:

$$\frac{\cos \theta_1}{\cos \theta_i} = \frac{t_1}{t_D} \quad \text{or} \quad \frac{\cos \theta_2}{\cos \theta_i} = \frac{t_2}{t_D}$$

for equations 9(a) and 9(b), respectively -- to what end? Moreover, the proffered substitution puts t_D in the denominator, which is just a coarse delay range adjustment value provided with delay unit 41 -- not a time increment representative of separation of the first source and the second source as claimed.

Yet another example arises concerning claim 42, which depends from claim 41, which in turn depends from claim 39, which in turn depends from independent claim 34. Among the

features not taught or suggested by the combination of Bhadkamkar, Lea, and the observed “frequency domain processing of Brandstein” is a characteristic signal that includes a spectral representation determined from at least the first and second phase difference as defined by claim 42.

In a further example, the features of claim 45 include the characteristic signal being representative of the location of the second source relative to the first source and including a spectral representation of the desired acoustic signal. The Office Action relies on the DOA estimator of Bhadkamkar to teach such features. Bhadkamkar fails to provide relative location between sources A and B -- only time delays. Even assuming *arguendo* that it did, there is no teaching or suggestion in any of the asserted references to select a characteristic signal representative of the location of the second source, where the interfering acoustic signal came from such source, and where the characteristic signal is also representative of the desired acoustic signal.

Besides the reasons given in connection with the rejection of claims 34, 37, and 45, additional grounds support the patentability of independent claim 46. The features of claim 46 include generating a number of location signals each corresponding to a different location relative to the first source with a desired acoustic signal coming from the first source, ... and generating a characteristic signal from the location signals, wherein the characteristic signal includes a spectral representation of the desired acoustic signal, corresponds to position of the second source (of the interfering signal), and is determined from a signal pair established from a number of delayed first signals and a number of delayed second signals. These features are not taught or suggested by the asserted combination. In fact, because other systems, such as Lea, associate peak correlation with a desired signal, such references tend to lead away from such

features. "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." MPEP §2141.02.

Dependent claims 47, 48, 50-54, 55, and 56 are patentable for some or all of the reasons previously set forth. Accordingly, it is believed the rejection is improper as to all claims and should be withdrawn.

The Office Action indicated that the rejection of claim 40 may be overcome by further defining the fraction. New claims 57-61 are provided to define different aspects corresponding to this fraction.

Secondary Considerations:

Even assuming *arguendo* that a *prima facie* case has been established with respect to some or all of the claims, several secondary factors rebut such a case. "Objective evidence or secondary considerations such as unexpected results, commercial success, long-felt need, failure of others, copying by others, licensing, and skepticism of experts are relevant to the issue of obviousness and must be considered in every case in which they are present." MPEP §2141. Furthermore, recognition of the invention in a pertinent trade journal also supports patentability in this context. *See, Vulcan Engineering v. Fata Aluminum, Inc.*, 278 F.3d 1366, 1373, 61 USPQ.2d 1545, 1548 (Fed. Cir. 2002). Furthermore, according to MPEP §716.01(B):

Evidence traversing rejections must be considered by the examiner whenever present. All entered affidavits, declarations, and other evidence traversing rejections are acknowledged and commented upon by the examiner in the succeeding action. The extent of the commentary depends on the action taken by the examiner. . . . Where the evidence is insufficient to overcome the rejection, the examiner must specifically explain why the evidence is insufficient.

Enclosed herewith is the declaration of Douglas Jones, PhD. under 37 CFR §1.132 (the "132 Declaration") that evidences secondary factors of at least recognition of the invention by publication in a scholarly journal, licensing, and long-felt, yet unmet need. Dr. Jones is not an inventor. The 132 Declaration also provides further evidence supporting the nonestablishment of a *prima facie* case under §103.

Prior Invention under 37 CFR §1.131:

The inventions of the present application are fully supported by the disclosure of U.S. Patent Application No. 08/666,757 (now Patent No. 6,222,927) (the "Parent Application"). In addition to being incorporated by reference, the present application substantially duplicates Figs. 1-9 of the Parent Application and accompanying textual explanations. Specifically, it should be appreciated that the written description of the Parent Application appearing on pages 1-3 is substantially the same as the written description of the present application appearing on page 1, line 13 – page 3, line 17; the written description of the Parent Application appearing on pages 8-17 is substantially the same as the written description of the present application appearing on page 9 – page 17, line 27; and the written description of the Parent Application appearing on pages 18-19 (Experimental Section) is substantially the same as the written description of the present application appearing on page 37 (Example One). In addition to this common subject matter, a timely claim of priority under 35 USC §120 has been made and there is at least one inventor in common. Accordingly, it is submitted that the pending claims of the present application are entitled to the filing date of the Parent Application of June 19, 1996 (the "Applicable Filing Date").

The Bhadkamkar reference has an effective date of September 18, 1995 and as such is subject to establishment of prior invention under 37 CFR §1.131. The pending claims define inventions conceived prior to 18 September 1995 (the "Effective Date") as evidenced by the attached inventor declaration submitted herewith under 37 CFR §1.131 (the "131 Declaration"). The 131 Declaration further includes corroborating evidence of such conception, evidence of the diligent pursuit of the invention just prior to the Effective Date to reduction to practice, and evidence of a reduction to practice on or before the Applicable Filing Date. By way of nonlimiting example, evidence of conception is supported by the research and development activity, and the facts and circumstances predating the Effective Date, as explained in the 131 Declaration and corroborated by exhibits E and F attached thereto. Due diligence just prior to the Effective Date is also evidenced by this information.

Furthermore, actual reduction to practice is evidenced by the favorable simulation of early 1996, and prototype testing that took place after simulation, but before the preparation of the Parent Application. Even assuming *arguendo* these events do not establish reduction to practice, they constitute further diligent activity towards the constructive reduction to practice resulting from filing of the Parent Application. This evidence establishes invention of the pending claims prior to the Effective Date of the Bhadkamkar reference. It should be noted that the Parent Application was filed less than two months after the corresponding invention information was provided to the counsel that prepared and filed the Parent Application (such counsel being the undersigned attorney). Furthermore, invention prior to U.S. Patent No. 5,715,319 to Chu filed on May 30, 1996, which was initially asserted in the first office action, is also established to the extent the Chu reference may be asserted in the future. The establishment

of prior invention in accordance with 37 CFR §1.131 is believed to overcome the §103 rejection based on Bhadkamkar, in addition to other grounds previously explained.

Conclusion:

New claims 62-66 are provided to define further inventive aspects of the present invention, and are likewise believed to be patentable over the references of record. In view of the foregoing, it is believed that claims 34, 35, 37-42, 44-48, 50-54, and 56-66 are in condition for allowance. Reconsideration of the present application as amended is respectfully requested. The Examiner is encouraged to contact the undersigned by telephone to address any outstanding matters.

Respectfully submitted:

A handwritten signature in black ink, appearing to read 'L. Scott Paynter', written over a horizontal line.

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